Smith (J. R.)

OBSERVATIONS

ON

TEXAS CATTLE.

AGE, WEIGHT, TEMPERATURE, LIVER AND SPLEEN.

By JOSEPH R. SMITH,

Brevet Colonel and Surgeon U. S. A.

MEDICAL DIRECTOR, DEPARTMENT OF TEXAS. MEMBER OF COMMITTEE ON CATTLE DISEASES, AM. PUB. HEALTH ASSO.

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OBSERVATIONS ON TEXAS CATTLE: AGE, WEIGHT, TEMPERATURE, LIVER, AND SPLEEN.

By JOSEPH R. SMITH, Brevet Colonel and Surgeon U.S.A.

San Antonio, Texas, November 8, 1883.

Since my last report, made to this association a year since, a large number of facts have been observed bearing on the normal liver and spleen weight and temperature of Texas cattle; incidentally, age and size have also been noticed and recorded.

These figures, thus obtained, are tabulated below. The tables are similar to those appearing in my former report, contained in Vol. VIII of the association reports.

The first table gives the weight of the liver and the spleen at different ages.

Table I.

Age.	Average Weight of Animals.	Average Weight of Liver.	Average Weight of Spleen.	Remarks.
	Lbs.	*Lbs. Oz.*	*Lbs. Oz.*	
Under 1 year, .	174	7	1 6.37	8 animals.
1 year, ...	240	7 8.85	1 7.44	128 "
2 years, . . .	309	8 2.69	1 14.64	87 "
3 " . . .	384	8 9.79	2 6.82	69 "
4 " . . .	422	8 13.82	2 4.31	208 "
5 " . . .	445	9 4.20	2 5.65	137 "
6 " . . .	488	9 9.60	2 7.54	97 "
7 " . . .	531	9 1.12	2 6.00	33 "
8 " . . .	578	9 7.80	2 3.58	40 "
9 " . . .	510	9 6.59	2 3.43	7 "
10 " . . .	508	10 2.67	2	3 "
12 " . . .	325	8 4.	. . . . .	1 "
15 " . . .	540	11 4.	3 4.	2 "

The second table gives the weight of the liver and the spleen in relation to the weight of the animal.

Table II.

Net Weight of Animals.	Number of Animals observed.	Average Weight of Liver.	Average Weight of Spleen.
		Lbs. Oz.	*Lbs. Oz.*
100 to 149 lbs., ...	17	6 1.71	1 8.65
150 to 199 "	43	6 2.86	1 4.95
200 to 249 "	57	7 8.23	1 6.
250 to 299 "	71	7 7.68	1 11.68
300 to 349 "	86	7 15.65	1 15.53
350 to 399 "	143	8 10.58	2 0.60
400 to 449 "	156	9 4.33	2 3.48
450 to 499 "	133	9 9.98	2 8.56
500 to 549 "	83	9 12.89	2 11.29
550 to 599 "	46	9 10.24	2 11.93
600 to 649 "	35	9 6.26	2 11.09
650 to 699 "	7	9 15.43	3 4.
700 to 749 "	9	9 0.79	2 12.79
750 to 799 "	7	9 12.29	2 12.
800 to 849 "	3	10 9.33	2 9.33
850 to 899 "	2	13 7.	2 9.
1000 "	1	16 4.	3 4.

The third table gives the spleen weight in relation to liver weight.

Table III.

In Cattle where Liver Weighed.	Number of Animals observed.	Average Weight of Spleen.
		Lbs. Oz.
4 to 5 lbs., ...	4	14.75
5 to 6 "	38	1 8.13
6 to 7 "	110	1 11.55
7 to 8 "	118	1 14.51
8 to 9 "	185	1 15.63
9 to 10 "	181	2 4.75
10 to 11 "	158	2 6.67
11 to 12 "	56	2 14.09
12 to 13 "	39	2 11.36
13 to 14 "	6	2 6.83
14 to 15 "	4	4 9.
15 to 16 "	2	3 14.
16 to 17 "	1	3 4.

Table IV gives the average age and the average net weight of animals killed at different places, and the average weight of livers and spleens.

Table IV.

Place.	Average Age.	Average Net Weight.	Average Weight of Liver.	Average Weight of Spleen.
	Years.	*Lbs.*	*Lbs. Oz.*	*Lbs. Oz.*
Fort Brown, ...	3¼	414	10 5.	2 5.12
Fort Clark, ...	3¾	484	8 10.19	2 15.69
Fort Concho, ...	3⅜	365	7 1.60	1 12.80
Fort Davis, ...	4⅛	492	11 0.80	2 11.90
Del Rio, ...	5	419	9 14.86	2 2.66
Fort Duncan, ...	2⅛	340	8 12.33	2 9.28
Fort McIntosh, . . .	5 1/10	398	8 0.69	2 1.45
Fort McKavett, . . .	1½	174	6 8.40	1 9.90
Peña, Colorado, . . .	2 1/20	347	9 4.80	1 15.10
Camp Rice, ...	2¾	319	7 11.25	1 3.81
Fort Ringgold, . . .	4⅛	423	8 9.07	2 1.67
Fort Stockton, . . .	4	503	11 3.83	3 9.78
Throughout the state, .	3 16/17	400	8 11.69	2 2.75

Table V gives the maximum, minimum, and average temperature observations for different points, and of all observations.

Table V.

Place of Observation.	Maximum Temperature.	Minimum Temperature.	Average Temperature.	Remarks.
Brown, . . .	103°.	102°.	102°.4	16 observations in rectum or blood-vessels on neck, by Dr. Maddox.
Clark, . . .	104 .8	101 .8	102 .69	54 observations in rectum or blood-vessels of neck, by Drs. Haines and Maddox.
Concho, . . .	105 .	102 .2	103 .29	43 observations in rectum or blood-vessels of neck, by Dr. Finley.
Del Rio, . . .	102 .8	100 .8	101 .59	107 observations in rectum or blood-vessels of neck, by Drs. McLain and Cooper.
Duncan, . . .	104 .4	101 .4	102 .47	27 observations in rectum or blood-vessels of neck, by Dr. Buffington.
McIntosh, . .	104 .8	101 .	102 .38	81 observations in rectum or blood-vessels of neck, by Drs. Ainsworth and Robinson.
McKavett, . .	105 .6	100 .	101 .99	92 observations in rectum or blood-vessels of neck, by Dr. Buffington.
Peña, Colorado,	105 .	100 .4	102 .5	76 observations in rectum or vagina, by Dr. S. S. Boyer.
Rice, ...	103 .2	101 .5	101 .88	19 observations in rectum or blood-vessels of neck, by Dr. Wolf.
Ringgold, . .	104 .6	99 .	101 .85	186 observations in rectum or blood-vessels of neck, by Drs. Roane, Tesson, Robertson.
Stockton, . .	104 .6	101 .4	102 .31	34 observations in rectum or blood-vessels of neck, by Drs. Carter and Fegan.
Whole state, .			102 .16	

The sixth table gives the proportionate weight of spleen and liver to each other, and to the weight of the animal, at different ages.

Table VI.

Age of Animals.	Proportion of Liver to Whole Body.	Proportion of Spleen to Whole Body.	Proportion of Spleen to Liver.
Below 1 year, ...	1/26	1/124	198/1000
1– 2 "	1/32	1/164	194/1000
2– 3 "	1/38	1/161	234/1000
3– 4 "	1/44	1/153	284/1000
4– 5 "	1/47	1/184	259/1000
5– 6 "	1/48	1/188	253/1000
6– 7 "	1/50	1/204	248/1000
7– 8 "	1/58	1/222	262/1000
8– 9 "	1/61	1/260	234/1000
9–10 "	1/54	1/231	235/1000
10–11 "	1/50	1/254	197/1000
15–16 "	1/47	1/163	288/1000

Table VII gives the proportionate weight of the liver and the spleen to each other, and to the weight of the animal, in animals of different weight.

Table VII.

Weight.	Percentage of Liver Weight to Weight of Animals.	Percentage of Spleen Weight to Weight of Animals.	Percentage of Spleen Weight to Liver Weight.
100 to 149 lbs., ...	4.41	1.113	25.24
150 to 199 "	3.64	0.767	21.05
200 to 249 "	3.34	0.669	18.21
250 to 299 "	2.26	0.645	23.16
300 to 349 "	2.53	0.615	24.34
350 to 399 "	2.35	0.552	24.29
400 to 449 "	2.25	0.535	27.79
450 to 499 "	2.07	0.546	26.33
500 to 549 "	1.92	0.574	27.68
550 to 599 "	1.71	0.470	27.54
600 to 649 "	1.54	0.441	28.57
650 to 699 "	1.52	0.497	32.62
700 to 749 "	1.28	0.395	30.98
750 to 799 "	1.30	0.366	28.15
800 to 849 "	1.32	0.307	23.23
850 to 899 "	1.58	0.304	19.26
1000 to "	1.62	0.325	20.

Tables 1, 2, 3, 4, 6, and 7 embrace figures from observations on 944 animals.

Concerning 904 of these animals are recorded the age, weight, liver weight, and spleen weight.

Of the remaining 40, all observations give the age; eight the age and weight only; and ten the age, the body weight, and the liver weight.

LIVER.

The average weight of the 934 livers weighed was 8 lbs. $11\frac{69}{100}$ oz. The average weight of the livers weighed in 1882 was 9 lbs. $7\frac{43}{100}$ oz; of those weighed in 1871, 7.54 lbs.

The average weight of all the livers reported by me is 8 lbs. $15\frac{26}{100}$ oz.

The liver of greatest weight was reported from Fort Stockton, and weighed 15 lbs. 8 oz.

The smallest liver weighed 4 lbs., and was noticed at McKavett.

But one liver was reported as presenting any pathological appearances. In this case, observed at Peña, Colorado, Dr. Boyer says,—"Tumor found on liver about the size of a large orange. It was situated over the convex surface of that organ, having its base at the inferior margin, its sac being formed from the fibrous tissue of one of the ligaments; contents of a white color, odorless, and of the consistence of thick cream. No constitutional symptoms appeared."

This tumor occurred in an animal aged one year, with a net weight of 249 lbs., its liver weighing 8 lbs. 8 oz., and its spleen 1 lb.

Three cases by Dr. Roane are reported, however, as *Hepar variegatum.*

(In tables A and B are consolidated the observations of this and former years.)

These tables show that the volume of the liver increases with both age and weight, increased weight of the animals being generally concomitant with increased age.

Tables VI and VII confirm the conclusions formulated last year, viz., that this viscus does not increase *proportionately* with the age or size of the animal. In animals aged less than one year, the liver weight was 1/26 of the whole body weight, and in animals aged one to two years the liver weight was 1/32 of the whole body weight, while from six years of age upwards the liver weight was less than 1/50 of the whole body weight. In animals weighing from 100 to 150 lbs., the liver constituted 4.41 per cent. of the whole body by weight, and this proportion regularly decreased, until in animals weighing more than 500 lbs. the liver constituted less than 2 per cent. of the whole weight of the animal.

SPLEEN.

Nine hundred and four spleens were weighed, giving an average weight of 2 lbs. 2.75 oz. No pathological appearances are reported in any of these spleens, and, concerning the majority of them, it was positively stated that they were healthy.

The smallest spleen reported weighed but 9 oz., and was observed in the valley of the Rio Grande near El Paso. The animal from which it was taken was two years old, and weighed 260 lbs. net weight. Its liver weighed 5 lbs. 8 oz.

The animals killed at this point habitually were young and of light weight, and of 101 examined the spleens of 27 weighed less than one pound each.

A spleen was reported from Fort Stockton weighing 7 lbs. 8 oz. This was the heaviest spleen reported anywhere, and was found in an animal aged six years, weighing 550 lbs. net weight, and with a liver weighing 14 lbs. 8 oz. I could not but feel some suspicion as to the accuracy of this observation, although the spleen weights at this point were habitually found much greater than elsewhere in this state. Yet in every case it was distinctly stated that no pathological appearances were found, or that the organs were normal.

Barring the spleens from Stockton, the heaviest spleen reported was found at Ringgold, and weighed 4 lbs. 12 oz. The animal from which it was taken was aged six years, weighed 500 lbs., and presented a liver weighing 9 lbs. The observer in this case, Dr. Jas. Roane, gave much care and attention to these observations, and his accuracy may be relied upon.

The average weight of all spleens reported in my tables for this and previous years is 2 lbs. 2.22 oz.

Generally the older and larger the animal, the heavier the spleen; but like the liver, the increase of the spleen was not in the ratio with the increase of years or body weight.

Below one year the spleens observed constituted 1/124 by weight of the animals, while after six years it was less than 1/200.

So as regards different weights, while in animals weighing between 100 and 150 lbs. the spleen constituted more than 1 per cent. of the net weight, in animals weighing 800 lbs. and upwards this organ constitutes less than one third of one per cent. (0.333).

The spleens generally weighed a little more than one quarter the weight of the livers (27 per cent.).

No case of diseased spleen has been reported in these numbers.

AGE.

The oldest animal, reported as killed for beef, was aged fifteen years, and the youngest, six months. The average age of those thus killed was a small fraction less than four years.

WEIGHT.

The weights of cattle killed for beef varied from a maximum of 1,000 lbs. to a minimum of 125 lbs., net weight. The average weight of all killed was almost exactly 400 lbs.

This year the heaviest animals were found from eight to nine years of age. Forty are reported killed at that age, their average weight being 598 lbs.; the next heaviest being between seven and eight, of whom thirty-three averaged 531 lbs. From this age up the weight, according to these observations, sensibly diminished.

TEMPERATURE.

Seven hundred and thirty-five observations for temperature are recorded and tabulated. Of these, 204 were taken in the rectum or vagina, and 531 in the blood of the great arteries of the neck.

The average of observations in rectum or vagina was 102°.34; of those in the blood, 102°.09; of both combined, 102°.16.

The average of all observations for temperature recorded in these and former tables by me is 102°.18.

The highest temperature observed in rectum or vagina was 105°.2; in blood, 105°.6.

The lowest temperature observed in rectum or vagina was 100°; in blood, 99°.

The highest temperatures generally are noted to have been in animals which had been irritated—struggling and furious—to an unusual degree.

In seventy-three animals observations were made both in rectum or vagina, and in the blood. In seven of these animals both thermometers registered the same in blood-vessel and in rectum. In six of them the blood temperature was the least by about .37 of a degree for each observation. In sixty of them the blood temperature was the greatest, averaging for each case 1°.

Nevertheless, on the more extended scale, the average blood temperature, in a set of 531 animals, was found higher than the average rectal or vaginal temperature in another set of 204 animals.

Among these observations are included thirty-four taken by Dr. S. M. Finley at Fort Concho, in rectum of thirty-four calves, resulting as follows:

Average temperature of	5	calves	under	1	month of age,	103.16
"	" 12	"	aged	1–2	" "	103.05
"	" 6	"	"	2–3	" "	103.16
"	" 6	"	"	3–4	" "	103.47
"	" 4	"	"	4–5	" "	103. 2
"	" 1	"	"	6	" "	104.

These calves were all very gentle. The differences of temperature, obtained at different places by different observers, are expressed in Table V.

Dr. McLain, at Del Rio, in 107 observations, obtained an average of 101.59.

Dr. Finley, at Concho, in 43 observations, obtained an average of 103.29. In these are included the preceding observations on calves.

In addition to the above 735 observations, 26 observations of blood temperature are recorded by Dr. Robertson, of Ringgold, in mass, and not in detail.

Dr. Robertson reports their average as 101°.92, and their correctness I do not doubt.

If those are added to all other observations of temperature in these tables, there will be found 956 observations, giving an average temperature of 102°.11.

I append two tables, A and B, giving the liver and spleen weight according to age and weight of animals, deduced from all observations heretofore made:

Table A.

Age.	Liver Weight.	Spleen Weight.
Years.	*Lbs. Oz.*	*Lbs. Oz.*
Under 1,	7	1 6.37
1 to 2,	7 13.86	1 7.68
2 to 3,	8 11.69	2
3 to 4,	8 12.55	2 5.26
4 to 5,	9 2.51	2 4.73
5 to 6,	9 2.61	2 5.25
6 to 7,	9 7.87	2 7.46
7 to 8,	9 0.63	2 5.47
8 to 9,	9 11.85	2 4.91
9 to 10,	10 2.83	2 6.50
10 to 11,	9 6.30	2 2.
11 to 12,	9	2
12 to 13,	8 4.	Not taken.
13 to 14,	7 14.	1 8.5
15 to 16,	11 4.	3 4.

Table B.

Weight.	Liver Weight.	Spleen Weight.
Lbs.	*Lbs. Oz.*	*Lbs. Oz.*
100–49,	6 9.17	1 8.61
150–99,	6 2.49	1 4.85
200–49,	6 2.69	1 7.36
250–99,	7 8.34	1 11.64
300–49,	8 3.46	1 15.24
350–99,	8 14.40	2 1.46
400–49,	9 5.05	2 3.31
450–99,	9 12.36	2 7.40
500–49,	10 2.62	2 11.40
550–99,	10 1.72	2 12.90
600–49,	10 0.32	2 14.84
650–99,	11 11.29	3 4.21
700–49,	10 8.80	2 14.80

Table B—continued.

Weight.	Liver Weight.	Spleen Weight.
Lbs.	*Lbs. Oz.*	*Lbs. Oz.*
750–99, ...	9 12.29	2 12.
800–49, ...	10 9.33	2 9.33
850–99, ...	13 7.	2 9.
1000	16 4.	3 4.

The following are deduced from all observations hitherto made for these reports:

Average Reported Age of all Animals Killed.	Average Reported Weight.	Average Reported Weight of all Livers.	Average Reported Weight of all Spleens.	Average Temperature of all Observations.
	Lbs.	*Lbs. Oz.*	*Lbs. Oz.*	
4½ years, . .	395	8 15.96	2 2.22	102°.11

Concerning the accuracy of the figures embraced in the foregoing, it may be said that the *livers* and *spleens* have been weighed carefully by competent and conscientious observers, and of their general correctness there can be no doubt. The same may be said of the correctness of the *temperature* observations.

Concerning the *age* and *weight*, some of the figures have been given by the butchers, and possibly may not be accurate as to days and months, or to pounds and ounces. But I believe that such inaccuracies are not sufficiently numerous or great to vitiate the conclusions drawn from the figures.

Since my report, made last November, the cattle in Texas have remained healthy, and no disease has become epidemic through the state.

Blooded stock imported from the North have, in many instances as heretofore, succumbed to disease, and this in cases where carefully prevented from intermixture with native herds, or from contamination by passing over their pastures or trails.

In reverting to the question of Texas fever (so-called), it must be confessed that much mystery still shrouds its ultimate cause and mode of dissemination. Is it true that Texas fever, or any other definite disease, is produced among healthy herds of cattle in the North by one mode only, viz., the passage of these herds over trails or into pastures where have recently passed or pastured herds of Texas cattle, themselves exhibiting no signs of disease, nor communicating disease of any kind to their comrades? Many cattle dealers and others believe that this question must be answered in the affirmative.

One of the reporters to the Department of Agriculture, in the "Report on Contagious Diseases of Domesticated Animals," issued by that department during the present year, speaks of it (page 106) as "a fact, undisputed by those who have had any experience with Texas or cattle fever, that native Texas cattle never contract the fever, or show plain symptoms of the same, so long as they remain undisturbed on their native range; that, however, if driven North at certain seasons of the year, though they themselves remain apparently healthy, they will infect their trails, pastures, watering-places, etc., and thus communicate the disease to such Northern cattle as may pass over the same road, graze on the same range, or use their watering-places after them; that in south-western Texas, both on the cattle ranges and the farms, only such cattle contract the fever as are imported from some place farther north; and that an animal affected with the Southern cattle fever never directly or by contact communicates the disease to other healthy cattle."

Dr. Salmon, whose report to the Commissioner of Agriculture of his "Investigation of Texas Cattle Fever and Fowl Cholera" is an admirable paper, writes (p. 25, op. cit.) concerning Texas fever,—"The native cattle in the infected districts seldom, if ever, suffered from it. Milch cows, fat cattle, and working oxen were the classes of animals generally affected, while calves, as a rule, escaped. The disease was spread by apparently healthy cattle, and these cattle infected pastures for weeks and months after leaving their native country. It was only contracted from infected grounds. Sick animals seldom, if ever, spread the contagion. A fence was sufficient to arrest the disease. The only kind of cattle that could be imported into the infected district with any safety was young calves. The disease almost invariably occurred in summer and fall, and was arrested by a frost." Surely the writer was justified in his next sentence in saying,—"This list of characters is so extraordinary, so different from what is seen with any other disease."

I am unable to find in Dr. Salmon's able report, or elsewhere, the proof of the existence of all these characters.

I find numerous detailed instances where disease appeared in herds of cattle, no satisfactory cause being apparent. Some, but not all, of these herds were affected after the proximity of Texas herds, but in no case is it conclusively shown that other causes than the vicinity of a herd of cattle from Texas were not present to originate the disease described.

Here an *experimentum crucis* should show,—

1st. A *healthy* herd of Northern cattle (not Texas) in an uninfected district.

2d. The passage of a herd of *healthy* cattle from Texas near the first named herd.

3d. The appearance of disease in the herd of healthy Northern cattle within a short time (perhaps a period of incubation) after the passage of the healthy Texas herd.

4th. The *absence* of *any other cause* that might have induced the disease in the Northern herd.

In the absence of demonstration of a *materies morbi*, or a connecting link of causation between the two herds, not one experiment alone, even as above conditioned, would suffice, but a sufficient number must be recorded to create a probability. The importance of, nay, the necessity of, establishing such connection, will be more manifest when it is considered that for large portions of the year some Texas cattle are almost continually on the drive or cattle trail, so that it would be impossible for the disease in question, or any other disease, to make its appearance, except at a period quite proximate to the passage of a Texas herd. Surely a proximity of place or time alone cannot be logically considered a cause of disease.

If certain known causes in certain instances produced the disease in question, the possible existence of these causes, at least, must be disproved before the disease is attributed to something else, more especially when this something else is something so improbable in itself as the fact of the mere passage over the trail where a *healthy* herd have moved,—a something so improbable in itself as a cause as to be spoken of by one of its believers as "very paradoxical, and contradictory to all known laws which govern the spreading of contagious diseases" (p. 106, op. cit.), while Dr. Salmon (p. 14 of this report, before cited) says,—"Many of these facts are widely, and, I might say, almost universally, contested by those who pretend to understand this disease."

Dr. E. M. Hunt, the president of this association, in his report to the Commissioner of Agriculture (p. 230, op. cit.), writes,—"The states have great occasion to ask that a series of crucial experiments shall decide whether (*a*) a Texas animal sick with the fever imparts the disease, (*b*) or whether a well Texas animal may be the host of the virulent particle, (*c*) or what relation animals that contract the disease from either of these bear to its propagation."

For myself, approaching the subject four years ago without any skepticism and free from bias, I have been forced, from very extensive correspondence, study, and observation, to come to the conclusion that it is not proven that "Texas fever is disseminated habitually, or at all, by the passage of healthy Texas cattle through a previously uninfected district, or that this disease presents any exception to the ordinary rules governing the spread of disease of the class to which it belongs."

Several gentlemen have interested themselves, and given me aid in collecting material for this report.

Dr. Forwood, on the staff of Lieut. General Sheridan, and Dr. Appel, Post Surgeon at Fort Elliott, have written very interesting communications concerning the dissemination of Texas fever among the herds near Forts Sill and Elliott, and Camp Supply, Tex. Drs. Gardner, Tesson, and Boyer have written of the Texas fever appearing near Fort Davis.

The bulk of observations made for these tables has been made by Drs. Ainsworth, Tesson, Carter, Maddox, Roane, Buffington, McLain, Boyer, Finley, Harmer, Wolf, Robinson, Robertson, and Hospital Steward Fegan, all of the U. S. A.